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CONTRIBUTIONS TO WESTERN BOTANY. No. 4.

BY MARCUS E. JONES.

Astragalus candidissimus (Benth.) Wat. Probably from a woody root if not shrubby, rather tall, a foot or two high at least; stems flexuous; peduncles one and one-half times longer than the leaf, rather stout; stipules minute. Mr. Brandegee's specimens from Magdalena Island have about eight pairs of leaflets, obovate-cuneate, rounded or emarginate at apex, scarcely petiolulate, appressed silvery silky, five lines or less long; whole leaf three inches long; petiole an inch or less long; flowers, in dense spikes which are two inches long, five lines long, almost sessile, minute bract twice as long as pedicel; calyx black-hairy, two lines long, cleft deeper on the upper side, teeth short, triangular, one-half the length of the campanulate tube; pods sessile,

membranous, inflated, an inch long when fully developed, minutely pubescent, oval, apparently circular in cross-section, with a short triangular point, very slightly pointed at base, horizontal, dorsal suture scarcely evident, generally sulcate slightly dorsally, ventral suture impressed about a line deep in the middle of the pod and seed-bearing for half the length of the pod, not impressed at base or apex, deeply sulcate ventrally to about one-third the depth of the pod, seeds small, many; young pods more pointed and hoary pubescent.

Other specimens from Scammon's Lagoon, Lower California, have oblanceolate leaflets, six lines long, neither truncate nor acute, twelve to fifteen pairs; no petiole; leaf three to six inches long; calyx, bracts, and spikes the same as above; flowers light purple, sides of banner and tip of keel dark; blade of keel two and one-half lines long, bent from base of blade to the blunt tip into one-third of a circle, very short and thick; broadly lanceolate wings, little ascending and a little longer than keel; banner ovate in outline, large, curved in an arc of a circle beginning at tip of calyx teeth, apex erect, two lines longer than keel; pods inclined to be ovate and more pointed, minutely pubescent, less deeply sulcate, but otherwise the same. The heads resemble *A. adsurgens*. Manifestly allied to *A. diphysus* and *lentiginosus*, despite the one-celled pod, but nearest to *A. oocarpus*. The whole section to which this belongs, from *A. curtipes* to *A. Douglasii*, is in great need of careful and extensive field studies. I have no doubt that there are twice as many species recognized as exist. This might be *A. vestitus* as far as the description goes, for some of the flowers might be called ochroleucous if taken alone.

Astragalus anemophilus Greene. (Includes *A. Miguelensis* Greene.) This is very closely related to *A. candidissimus*, and may prove to be identical with it, and is quite likely to be *A. vestitus*. It differs from the former so far as the type goes in the stipules being connate opposite the petioles, and in the white-woolly pubescence. The flowers are too immature to determine what they are. The pubescence of *A. candidissimus* is woolly or tangled on the calyx, but elsewhere is of straight or slightly tangled hairs which are appressed. The leaflets of this species

are in ten to fourteen pairs, oval to elliptical, truncate to acutish, and sometimes apiculate, four lines long; petiole an inch long or none; flowers in a short and rather loose spike; pods hoary to almost glabrous; calyx two lines long, campanulate, teeth triangular and very short; pods the same as in *A. candidissimus*, also the pedicels, bracts, and peduncles. This is probably woody at base. The calyx is cleft deeper above, little gibbous, teeth nearly equal; flowers ochroleucous and ascending. Described from the type in the California Academy. Collected by E. L. Greene at Cape San Quentin, May 10, 1885. So far as the description goes, this also might be *A. vestitus.*

Astragalus Miguelensis Greene. Probably woody or shrubby at base; stems, peduncles, leaves, bracts, pedicels and keel the same as in *A. candidissimus;* leaflets in ten to thirteen pairs, two-thirds of an inch long or less; flowers in a dense head or very short spike; calyx short-campanulate, cleft deeper above, teeth triangular-subulate, unequal, the lower nearly the length of the tube which is one and one-half lines long; flowers inclined to be reflexed, ochroleucous; keel three lines longer than calyx teeth; wings narrowly and obliquely lanceolate, and slightly ascending, two lines longer than the keel; banner ascending in a broad arc, and tip nearly erect, oval, a line longer than the wings; pods in a dense head, an inch long, exactly those of *A. candidissimus*, but perfectly glabrous, membranous and a little stiffer than the other, striate and faintly corrugated crosswise; seeds dark and nearly round. The upper stipules are not connate, though the lower ones are. The spike and flowers remind one of *A. Canadensis.* Collected by E. L. Greene at San Miguel Island, Cal., September, 1886. As Mr. Greene has suggested, this is probably a form of *A. anemophilus,* unless there is a good character in the flowers, and I doubt that. This plant from the Herb. Cal. Acad. is ticketed in the handwriting of Mr. Greene, but differs in a marked degree from his description in Pittonia i, 33, and it differs from *A. anemophilus* more than that does from *A. candidissimus.* The pubescence is woolly but with some straight hairs in places. As the stipules vary there is really nothing but the woolly pubescence to keep *A. candidissimus, vestitus, anemophilus* and *Miguelensis* from being combined; this is, however,

a character of great weight so far as my knowledge of the genus goes, yet it may be variable in the southern and hot regions.

Astragalus fastidiosus (Kell.) Greene. *Phaca fastidia* Kell. Hesperian iv, 145. I doubt if this is a valid species. It is too near *A. curtipes*, and all of the species given in the Botany of California along with *A. curtipes* are founded on weak distinctions. This species is like its relatives, not only inclined to be shrubby at base but most manifestly so. The leaflets are two to six or more lines long, obovate to almost linear, obtuse or retuse, narrowed at base and about nineteen; peduncles at least six inches long; calyx teeth shorter than the tube or not longer; pod semi-ovate, narrowed but not acuminate at base, apex acuminate or rather short-pointed, incurved; stems densely white-hairy; leaves almost glabrous to white-pubescent. Described from type collected on Cedros Island, by E. L. Greene.

Astragalus pachypus, Greene. This most distinct and very interesting species would be referred to the *A. nudus* section if it were not almost two-celled. This frequent finding of plants that destroy all our notions of classification into Astragalus proper and Phaca, leads one to hope that the division of the pod will take a minor place, so that species that are otherwise related may be grouped together and not widely separated, as they are at present in the common methods of classification. In addition to the published description I find that the pod is very much laterally compressed and is one-celled at the apex.

Astragalus collinus, (Dougl.) var. *Californicus*, Gray. *A. Californicus* Greene, Bull. Cal. Acad., iii, 157. This plant reminds one forcibly of *A. Drummondi* in habit. It is erect; leaves without a petiole to speak of, two to three inches long; leaflets about ten pairs, set very close together, three-quarters of an inch long, obtuse or emarginate; peduncles about three times as long as the leaves; calyx campanulate or occasionally very shortly cylindric, tube two lines long, one and one-half lines wide, teeth one-half a line long and broadly triangular, calyx rather sparsely short-hairy, yellowish; legume vetch-like, one and one-half inches long and two and one-half lines wide, acuminate at base, on a stipe four lines long, sharply acute at

apex, and pendulous; keel exceeding the calyx teeth by two lines, wings one and one-half lines longer than keel, and banner two lines longer than wings, banner erect, wings and keel arched, broad tip of keel incurved at a right angle. Otherwise, as in *A. collinus.* Described from the type collected at Yreka, Cal., by E. L. Greene. This differs from *A. collinus* (*Phaca collina* Hooker) as described in Flora of North America, T. & G., 347, in the leaflets being closely set and not "remote," shorter, peduncle longer, calyx not "tubular" nor "elongated" but campanulate as a rule, and in the banner being much longer than the elongated wings. It differs from the description given in King's Rep., p. 444, in the pod being linear and not linear-oblong. Watson there gives the calyx as oblong-campanulate or cylindric, and the pod as an inch long. Canby, in Botanical Gazette, xii, 150, gives it as his opinion that this is only a variety of *A. collinus.* No one seems to have remarked upon the short keel and close set leaflets. If these are common to the true *A. collinus*, then, no doubt, this is a form of *A. collinus.*

Astragalus Mogollonicus, Greene, Torrey Bulletin viii, 97. This is only a form of *A. Bigelovii* apparently, as it is a common thing for *A. Bigelovii* to be very hirsute with yellow hairs, and the pod is from oval and short pointed to lanceolate and rather long pointed. The immature pod of this plant is straight and cylindric-lanceolate. Rusby's specimen is fully as large as *A. Bigelovii* and like it in all respects so far as can be seen, but it has no mature fruit, while Greene's specimen, the type, is very young and without fruit at all. I have a specimen of *A. mollissimus* from the same region, the San Francisco Mountains, Ariz., that, so far as the yellowness is concerned, would pass for *A. Mogollonicus* were it not for the cylindrical and perfectly glabrous pods.

Astragalus calycosus Torrey var. *scaposus* (Gray) *A. scaposus* Gray, Proc. Am. Acad. xii, 55. *A. candicans* Greene, Bull. Cal., Acad. i, 156. It is strange that Dr. Gray did not recognize the close relationship of this plant with *A. calycosus.* It has only the remotest resemblance to *A. Missouriensis* and no relationship to it. The true *A. scaposus* differs from *A. calycosus* only in the short and triangular calyx lobes and the less

deeply cleft wings, and longer calyx tube. It is a little more robust and with larger flowers, but I have specimens from the Buckskin Mountains, Northern Arizona, on the border of Utah, with the calyx lobes one-half as long as the tube, and not deeply cleft wings. My specimens of *A. scaposus*, named by Dr. Gray himself, show a great diversity in the lobing of the wings. Specimens from Southeastern Utah, collected by Miss Eastwood, have a short calyx and short teeth, but are otherwise as in *A. calycosus*. I have given a full description of *A. calycosus* in "Contributions No. 3," so that it is not necessary to repeat the character of the pod, which differs in no respect, when fully developed, from *A. scaposus*. I have compared the type of Mr. Greene's *A. candicans* and find that it differs in no respect from *A. scaposus*.

Astragalus Hosackiæ, Greene, Bull. Cal. Acad. i, 157. This is a common form of *A. humistratus*. I have plenty of specimens, gathered along with the usual form of *A. humistratus*, that have the pod of *A. Hosackiæ* and the general form of the leaves of *A. humistratus*. I have others with the leaves and general aspect of *A. Hosackiæ*. Mr. Greene's species seems to grow in the shade, where the leaves become wider. The pod of *A. humistratus* varies greatly, being curved to a half circle or nearly straight and short; it is also a little sulcate dorsally often. The crowding of the leaflets and leaves is of common occurrence.

Astragalus Gilensis Greene, Torrey Bull. viii, 97. This is a very distinct and interesting plant, but belongs to the Homalobi. The keel is incurved and sharply acute, one-half a line shorter than the wings, banner one to one and one-half lines longer than wings, the keel exceeds the calyx teeth by a line only; calyx tube one and one-half lines long, narrowly campanulate equaling the subulate teeth; bracts hyaline, acuminate, lanceolate, one and one-half lines long, longer than the short pedicel; calyx contracted at base; flowers in a head which is one-half an inch long; pod flattened laterally, about two-seeded, obliquely ovate-oblong, one-celled, no intrusion of sutures, thin-chartaceous, dorsal suture about straight, ventral much arched, the pod seems to be wrong side up but it is not so, sharp pointed,

both sutures prominent externally, pod three lines long; lower stipules large and hyaline and densely imbricated; leaflets five to eight pairs two to three lines long, elliptical and appressed silky; leaves two inches long, root woody and large. This seems to be near to *A. miser.* This description is drawn from the type collected on the Gila River, by E. L. Greene. I do not attempt to give a full description, as the other characters are given by Mr. Greene.

Astragalus insularis, Kellogg. I do not know where this was first published. Annual or flowering the first year. The small plants have the habit of *A. Geyeri* and a remote resemblance to *A. triflorus.* Many-branched at the summit of the root and rather slender, lateral branches probably prostrate or ascending, and the central ones erect or nearly so. Flowers two lines long, keel, wings, and banner nearly equal, not curved; very campanulate or globose calyx sessile and as long as the subulate-triangular teeth, calyx and teeth scarcely over a line long in all, calyx reflexed in fruit; pods broadly ovate, sessile, membranous, one-celled and not sulcate, sutures scarcely visible, pod much inflated, about five lines long, rounded at base and with a triangular laterally flattened, sharp apex which is one or two lines long, the beak is flattened so as to be no thicker than paper in the second form given below, cross-section of pod apparently circular; peduncles one to two inches long, rather stout, shorter than the leaves, three to six-flowered, racemosely and remotely on the upper half of the peduncle; leaves with three to five pairs of elliptical-linear and apiculate leaflets which occur on the upper half of the rachis or common petiole; whole plant, even to the pods, minutely pubescent. Cedros Island, collected by Dr. Veatch, 1877, June 4th. Another form, if such it be, is the upper part of a stem that may have been a foot or two long; it has seven to nine pairs of acute leaflets, six lines long, no proper petiole; leaves four inches long; peduncles two and one-half to three inches long and stout; pods globose but with the peculiar beak three lines long. Cedros Island, Dr. Veatch. This species seems to belong near *A. macrodon. A. Pondii* Greene, Pittonia, i, 288, is the same so far as the published description goes.

Astragalus streptopus Greene, Bull. Cal. Acad. i, 156. This I take to be a form of *A. Nuttallianus*. The only difference seems to be that the flowers are a little more numerous and racemose and the leaflets are often retuse. I have specimens with racemose flowers, and others with the pods wrong side up by the twisting of the pedicels, and otherwise intermediate.

Astragalus albens Greene, seems to be a good species but very close to *A. Nuttallianus*, though Watson places it near *A. tricarinatus*. It would pass for a form of *A. Nuttallianus* with wider leaves and tips of pods. If this is a perennial it blooms the first year. It is prostrate or ascending, six inches or more long, many branched from the base; raceme loose; peduncles twice as long as the leaves, which are one to two inches long, petiole over one-half of the whole; keel purple tipped, very broad and blunt, longer than the wings and equaling the broad banner, two lines longer than the calyx and teeth, which are a line long, teeth equaling the campanulate tube, pedicel nearly as long as the tube; pod broadly linear, narrowed and pseudo-stipitate at the base, broadest at apex, which is sharp-pointed and triangular, laterally compressed, minutely and rather sparsely short-pubescent, not at all silky except when very young, two-celled. Described from the type.

Astragalus Rusbyi Greene, is a good species. I also collected it in abundant material near Flagstaff, Ariz., 1884.

Astragalus malacus Gray, var. *Layneæ* (Greene). *A. Layneæ* Greene, Bull. Cal. Acad. i, 157, belongs to the Micranthi. In addition to the characters given I find the flowers are purple, one-half an inch long; wings narrow, just surpassing the keel, and banner but little longer; banner ascending; keel apparently with an obtuse short beak; leaves almost oval, very villous-woolly, the hairs very fine, not much tangled in the type but much so in Parish's specimens, attached by the small pustulate base, the leaflets in the Mrs. Curran specimens are obovate; the flowers seem to be reflexed and the pods erect; calyx campanulate, nigrescent, three lines long, with very short, triangular, black-hairy teeth; peduncles very stout, twice longer than the four-inch-long leaves, or subscapiform, and eight inches long in Mrs. Curran's speci-

mens; stipules large, connate below, acuminate and hyaline. In Mr. Parish's specimen the pod is nearly two inches long, linear, contracted at base and sessile, sulcate dorsally, and dorsal septum intruded to the middle of the cell, apex of pod acuminate to an almost thread-like tip which is laterally compressed, pod slightly obcompressed, finely corrugated, coriaceous, rather sparsely villous-woolly when ripe, ventral suture rather prominent; pedicels very short; bracts ovate and rather large. In Mrs. Curran's specimen the pod is completely divided by the intrusion of the dorsal sulcus from the base nearly to the apex, much obcompressed by necessity from the curving of the pod into a circle, ventral suture ridged; perennial and many branched from the base, erect, stem very short.

The above descriptions are drawn from the types. I find that the pods have much shorter pubescence which is more generally appressed; the plants are less branching and peduncles more inclined to be subscapose, and the flowers are more inclined to be racemose; the sulcus is more open and wider; pods narrower than *A. malacus.* Specimens collected by Mr. Brandegee, at Inyo, Cal., April 15, 1892, clearly connect the two. The flowering specimen of the Herb. Cal. Acad. has white or ochroleucous flowers with only a tinge of purple at the tip of the parts; calyx that of *A. Layneæ* and pods of *A. malacus* with the short pubescence on them of *A. Layneæ;* pods not at all obcompressed but decidedly compressed; general habit of *A. Layneæ.* The fruiting specimen on the same sheet has nearly the calyx of *A. malacus* and its branching caulescent habit, but the pods are those of *A. Layneæ.* I also have specimens of *A. malacus* from Western Nevada with pods much like those of *A. Layneæ* but nothing to warrant the reference that Mr. Brandegee's specimens require. I find in Mr. Brandegee's specimens that the keel is as often without a beak as with, and so that character fails.

Astragalus Gibbsii Kell. (*A. cyrtoides* Gray.) The type in the Herb. Cal. Acad. has eight to ten pairs of obovate-cuneate leaflets which are so deeply notched as to be obcordate occasionally, at other times they are scarcely notched at all, seven lines or less long, four lines or less wide, shortly petiolulate; petiole less than an inch long; stems and peduncles grooved; corolla

and calyx yellow, the latter with short wool; calyx tube three lines long, two lines wide, teeth a line long and triangular and stout; calyx about as large at base as apex and so short-cylindric; the corolla does not extend more than five lines beyond the calyx teeth; the short very blunt keel whose tip is bent into a semi-circle surpasses the teeth by three lines; the broadly lanceolate wings which are as wide as the keel surpass it by two lines; the broadly ovate banner is sharply arched just beyond the calyx teeth into an erect position and so does not extend as far as the keel; the ovate woolly bracts are hyaline and a line long and equal the stout pedicels; lower part of stem is absent and there is no fruit; stipules triangular, short, green. Collected by G. W. Gibbs on the headwaters of the Carson River, Cal. Read before the Cal. Acad. Nov. 18, 1861. The whole plant has short spreading wool or hairs and is rather canescent; pedicels attached by one corner of the calyx; leaves four inches long; peduncles six inches long, very stout; flowers six to eight, subcapitate.

Astragalus cyrtoides Gray, collected by Lemmon in Sierra Valley, Cal., is many stemmed from a woody root, stems often slender, erect and scarcely sulcate, a foot high, flexuous; pubescence even to the calyx the same as in *A. Gibbsii;* leaflets six to eight pairs, from cuneate and almost lobed at apex to oblanceolate and truncate, six lines or less long; petiole seldom over one-half inch long; leaves three inches long; stipules triangular and like those of *A. Gibbsii* but more acute; peduncles four to six inches long, not very stout, grooved; flowers loosely spicate; pedicels two lines long, twice the length of the ovate, hairy bract, not very stout; calyx narrowed, cylindric-campanulate, four lines long, one to two lines wide, scarcely gibbous at base but pedicel bent at point of insertion to a right angle; teeth the same as those of *A. Gibbsii* or narrower; flowers the same but wings surpassing the keel only a little; pod an inch long exclusive of the one-half inch long stipe, acuminate at both ends and sharper at base, three lines wide, one and one-half lines thick, cross-section, shallow-obcordate, short-pubescent with erect hairs, one-celled, neither suture impressed, but pod dorsally sulcate, ventral suture

prominent and sharp edged externally, pod arched into one-third to one-half a circle, erect.

Specimens collected by Mr. Brandegee at Milford, Cal., June 26, 1892, are substantially those of Mr. Lemmon but calyx gibbous, more cylindric; pods less acuminate, and stipe just equaling tip of calyx teeth; pods shorter, slightly arched, both sutures prominent, not at all sulcate or with only a trace of it.

My own specimens gathered at Carson City, Nev., May 23, 1882, are exactly the type of *A. Gibbsii.* Those collected also by me at Empire City, Nev., June 20, 1882, and distributed as No. 3829 have the flowers of *A. Gibbsii* but the calyx a little narrower; pedicels as long or two lines long; leaflets six to ten pairs, like those of Mr. Lemmon's specimens, short-woolly, and whole plant canescent throughout; pods very short-pubescent, not at all sulcate, cross-section about circular, pod an inch long, bent into fully or more than a semi-circle; stipe equaling or twice as long as the calyx; pods oblong-linear, shortly and equally acuminate at each end, stems branched above, a foot high. Other specimens gathered at the same place have pods the same width as the above but only one-half an inch long, very sharply acuminate; stipe shorter than the calyx; pod slightly arched, otherwise as above.

Astragalus recurvus Greene. This is *A. obscurus* Watson. I have specimens of *A. obscurus* from Nevada collected by myself with recurved pods, and also specimens from Northern Arizona collected by me near Flagstaff in 1891 with the pods curved fully as much as the type and with crimped edges.

Astragalus adsurgens Pall. This species is in great need of a new description for the lobes of the calyx are often as long as the tube, the leaflets vary from linear lanceolate and one and one-half inches long to oblong-elliptical and obtuse or acute. The pods are one-celled, sulcate dorsally from one-fourth to one-third their width and dorsal septum produced as much more into the pod, but never two-celled; the flowers are purple or white. My specimens were named by Gray.

Astragalus circumdatus Greene. Scytocarpi, and nearest to *A. Chamæleuce*, but widely different from it. In uniqueness it ranks

along with *A. pachypus*. Apparently loosely cæspitose from a much branched woody base, two to five inches high or more, stems rather slender though not for the size of the plant, nodes one-fourth to one-half inch apart, or even closer; stipules rather large for the plant, scarious, ovate, almost connate, free; stems three to five inches long, ascending or some of them horizontal, almost glabrous; leaves two to three inches long with petiole which is nearly one-half the length; leaflets eight to twelve pairs, one-fourth inch or less apart, truncate or emarginate, oblanceolate to oval, one to four lines long, very decidedly petiolulate, very sparsely pilose, or almost glabrous, the leaves are so small that though the hairs are short they are still long for the size of the leaf; peduncles slender, shorter than the petiole and far overtopped by the uppermost leaves which are not at all reduced but are the largest of all; flowers subcapitate, five to twelve, on slender pedicels which are one to one and one-half lines long and twice the length of the ovate, byaline, rather pilose bract; flowers horizontal, four lines long, ochroleucous in the dried specimen; calyx tube campanulate, one and one-half lines long, a little longer than the subulate lobes, whitish, rather densely short-hairy and canescent; banner very wide at base and narrower upwards, emarginate, bent at a right angle and erect, a line longer than the keel; keel nearly straight but tip incurved at a right angle and acuminate, the erect part nearly as long as the rest of the blade; wings apparently lanceolate, ascending and little exceeding the bend in the keel; pod apparently horizontal or reflexed, fleshy, coriaceous, one-celled, neither suture impressed but both very thick and prominent and rounded externally, pod minutely and sparsely pubescent when mature, or glabrous, faintly corrugated, abruptly acute with a stout beak and almost acute at the sessile base, six lines long or less, half oval to almost elliptical, ventral suture nearly straight, dorsal arched, apparently a little compressed when young but nearly round thereafter in cross-section, faintly bisulcate on the ventral side but the obcompressed appearance is doubtless due to the pressing, as other pods are as markedly compressed from the same cause. The flowers and pods lie among the leaves but are not concealed by them, usually only two to four pods mature on the

same peduncle and are scattered. The immature pods are quite appressed-hairy. Described from the type in the Herb. Cal. Acad. Collected by Mr. Lemmon at Hanson's Ranch, Lower California, July, 1888.

ASTRAGALUS ANISUS, n. sp. This is near the Mollissimi. Very low, two or three inches high and very short-stemmed, perennial, silky pubescent, with rather long and loosely appressed hairs which are slender, very echinate, and attached by the middle; stems, stipules, and leaves silvery with long hairs; peduncles less pubescent; calyx nigrescent only, with sparse hairs; pods softly and rather thinly pubescent with short hairs. Leaves two inches long and petiole as long as the rachis, leaflets three to six pairs, obovate to oval, two to three lines long. Peduncles longer than the leaves and with stout fruiting pedicels two lines long. Flowers erect or spreading, six to ten and probably subcapitate; calyx-tube broadly cylindric, four lines long exclusive of the subulate teeth which are less than a line long; corolla not seen; pods almost an exact oval, very obtuse at each end but apiculate at apex and abruptly contracted into a pseudo-stipe which is very short, at base two-celled, six lines long, chartaceous, finely corrugated, sulcate ventrally but not deeply, and slightly sulcate dorsally often. Collected at Pueblo, Colo., by Miss A. P. Lansing, and communicated by Miss Alice Eastwood.

ASTRAGALUS WETHERILLI, n. sp. With the habit of *A. triflorus* and nearest to *A. allochrous* in general character except the jointed pedicel. Ascending twelve to eighteen inches high and many stemmed from a rather woody, perennial root, glabrous or very sparsely pubescent on the upper stems and rachis; calyx nigrescent with short hairs; young pods ashy with minute white hairs, mature pods very sparsely and minutely pubescent. Stipules small. Lower leaves small, one to two inches long, with four to five pairs of obovate rounded to retuse leaflets, two to three lines long; uppermost leaves largest, three to four inches long, including the inch-long petiole; leaflets, six to eight pairs, oval to obovate, obtuse, four lines long. Peduncles one to two inches long and capitately six to eight-flowered, rather stout,

with pedicels a line long in flower and two lines long in fruit, twice as long as the ovate bract. Calyx narrowly campanulate two and one-half lines long including the subulate teeth which are a line long; flowers four lines long, white with pink-tipped banner, keel straight to the abruptly incurved (to a right angle) apex, one and one-half lines longer than calyx teeth, wings just surpassing the keel and upwardly curved so as to conceal it, banner two lines longer than keel, broad, rounded, ascending somewhat; pods three-quarters to an inch long, obliquely ovate and shortly acuminate, obtuse at base but contracted, jointed to the line-long stipe at its apex, thin-characeous, not pendulous or purple spotted, sulcate ventrally, not at all dorsally, ventral septum also extended a line deep in the centre of the pod but not at all at each end, straight, dorsal septum bent to an arc of an oval, pod inflated and cross-section nearly round.

Collected at Grand Junction, Colo., May, 1892, by Miss Alice Eastwood, and dedicated to Mr. Alfred Wetherill by request.

ASTRAGALUS CICADÆ, n. sp. This appears to be near *A. megacarpus*, and has the habit and general appearance of *A. amphioxys*. Perennial, depressed, and almost stemless, three to four inches high. Stipules large for the plant, hairy, acute, and connate below. Petioles, peduncles, and leaves silvery with appressed, very acute, echinate, hairs that are fixed by the middle. Leaves about two inches long, with three to four pairs of broadly to narrowly elliptical leaflets, three to four lines long. Peduncles one and one-half inches, long, decumbent, capitately few-flowered, and with pedicels a line long equaling the ovate, acute, hairy bract. Calyx broadly cylindrical, nigrescent with sparse and very short hairs, four lines long exclusive of the subulate teeth a line long; flowers apparently ochroleucous, exceeding the teeth by four lines, keel nearly straight and but little incurved at the obtuse tip, wings a trifle longer, and nearly equaling the slightly ascending banner; pod obliquely oblong-lanceolate, one and one-half inches long, shortly acuminate, somewhat incurved, not stipitate, but a little contracted at base, minutely and rather sparsely pubescent,

purple spotted, young pod pulpy and corrugated, mature pod with membranous outer coat very coarsely reticulated transversely and suggesting the wing of a cicada, inner skin stiffer, both sutures much thickened within and pulpy but not much intruded, pod occasionally slightly sulcate ventrally, very acute.

Grand Junction, Colo., May, 1892. Collected by Miss Alice Eastwood.

The following forms, except the first, would readily pass for new species, but in view of the great variability in the pod of *A. Preussii* it seems better to describe them as varieties until the real limits of that species are known.

Astragalus Preussii Gray, Proc. A. A. vi, 222. See also Vol. xiii, 369, and Bot. King's Exp. Rev. Astragalus, Watson.

The specimens collected by Miss Eastwood at Moab, Utah, May, 1892, approach the type very closely. Glabrous throughout except calyx speckled and teeth black with flat, short-twisted hairs fixed by the base, plant a foot high; leaflets oval to narrowly elliptical. Peduncles equaling the leaves, stout, five to ten-flowered; flowers spreading and in fruit ascending, purple, three-fourths of an inch long; pedicels a line long and twice shorter than the ovate, hyaline, acuminate bract; calyx five lines long, two lines wide at base, and one and one-half wide at throat, cleft a little deeper on the upper side, teeth subulate, a line long; keel straight, to moderately incurved at blunt apex and scarcely shorter than the wings, banner elongated, purple veined, ascending; pod with evident sutures, abruptly contracted at each end, and with subulate point at apex a line long, this broad based beak is very characteristic, the stipe is about two lines long, and the pod is oblong elliptical. Otherwise agreeing with the type exactly. Collected by Miss Alice Eastwood at Moab, Utah, May, 1892.

Astragalus Preussii Gray var. LATUS, n. var. Leaves obovate-cuneate to nearly linear; peduncles longer than the leaves; calyx cylindrical; banner shorter and wings longer than in the above; pod nearly round, but ventral suture nearly straight, three-fourths of an inch long, apex subulate three lines long and prow-like, stipe two lines long; pod thick-chartaceous, but not

coriaceous. Plant a foot high, or less, and growing in dense clumps. This is seemingly very distinct, but is connected with the type by forms with ovate pods. In pubescence, pedicels, calyx, and corolla it agrees with the type. Collected by me at Green River, Utah, May 7, 1891, and connecting forms at Cisco at the same date.

Astragalus Preussii Gray var. SULCATUS, n. var. Densely branched from the base which is almost woody, six inches high. Stipules not large lower ones sheathing, hyaline, very broad and blunt. Leaflets about ten pairs as in the type, but generally narrowly oblanceolate, two to four lines long, rachis two to four inches long, and proper petiole very short. Flowers a line shorter than type on pedicels two lines long, which are twice the length of bract. Calyx three lines long, cleft a little deeper than the type and not contracted at throat, otherwise both calyx and corolla as in the type. Pods horizontal, oblong-oval, abruptly contracted at both ends, apex very acute with a short triangular beak, pod round in cross-section, straight, ventrally sulcate a line deep and suture often extended one-fourth of a line deeper, pod much inflated, chartaceous, three-fourths of an inch long, often reddish, but not spotted. Collected by me in abundant specimens May 6, 1891, at Westwater, Colo., and in fruit only by Miss Alice Eastwood, at Cane Spring, Utah, May, 1892. This is so like the variety *latus*, except in the sulcate pod, that it seems best to put it as a variety of the above.

Astragalus pictus Gray var. ANGUSTUS, n. var. Like the type but pods eight lines long, two to three lines wide, oblong-oblanceolate very acute at apex and narrowed gradually into the stipe which is as long as the calyx. Collected in Montezuma Cañon, Utah, May, 1892, by Miss Alice Eastwood.

Astragalus desperatus Jones. Specimens collected by Miss Eastwood have the over-ripe pods almost chartaceous.

Astragalus Coltoni Jones has the pod in one specimen broader and less stipitate, and in another specimen has the leaves much broader, otherwise as in the type.

ASTRAGALUS PALANS. Stems long and flexuous ascending or erect from a perennial root, nodes distant, glabrous throughout

except the sparsely nigrescent calyx. Leaves three to four inches long and with a very short petiole, central ones the largest, leaflets on the lower leaves three lines long and obovate and rounded, eight to ten pairs, central leaves with leaflets one-half inch long, obovate to elliptical and retuse. Peduncles very stout, sulcate and longer than the leaves, six inches long and widely spreading, racemosely six to ten flowered near the apex, pedicels a line long and equaling the bract, stout; calyx tube campanulate cylindrical, two lines long, hyaline, somewhat reflexed, teeth one and one-half lines long and filiform from a broad base, keel moderately arched, surpassing calyx teeth by three lines; faintly pink tipped, narrowed at obtuse apex, wings about equaling the keel and the banner is a line longer and pink. Pods about linear, very acutely beaked, sessile, base pendent and apex erect, the pod being bent nearer the base than apex into a sharp curve so that in some cases the apex touches or surpasses the base, very slightly obcompressed, very slightly sulcate dorsally and occasionally so ventrally, dorsal septum produced so as to make the pod almost two-celled, but not quite. This plant seems to be nearest *A. distortus*, but is quite peculiar. Montezuma Cañon, Utah, June 1, 1892, Coll. by Miss Alice Eastwood.

NEILLIA.

It was my intention to take up this genus later, but in going over my herbarium to fill out some exchanges it has come in my way to study the whole genus.

The recent revision by E. L. Greene has changed the nomenclature considerably.

My method of field study for the last fifteen years has been to collect a large amount of typical material for my sets and exchanges, and to collect for myself from one to five or more specimens of flower and fruit of every deviating form, and to accompany them with such notes as the specimens would not show. I have in this time gathered from a wide field, from Iowa to California, a large amount of material on this and other genera. It early became evident that the characters of Watson's *Neillia Torreyi* as given by himself were valueless, and I sent him a full suite of material showing it, but with his usual persistence he

would not yield. I then decided to take up the genus myself, but lack of time has prevented till now.

I find that the lobation and dentation of the leaves are of little value, also the inflated calyx with connivent lobes, and the shape of the seeds, as well as the pubescence of the pods. The number of seeds in the carpels is very treacherous. The stamens are almost always twenty, in *N. opulifolia* in two ranks and about forty, and the anthers broadly or narrowly oval, the filaments are usually slightly wider at base only and about a line long. The pubescence is always stellate or at least branched in that fashion, but is very variable, and of almost no value. The seeds are always oblique. All the leaves of the genus are three-nerved, five-nerved only by accident.

Taking the order as given by Mr. Greene *N. opulifolia* (L.) Watson, comes first under the heading of "carpels inflated, exserted from the calyx, divergent at apex, bivalvate-dehiscent." The pods are divergent of necessity and are bivalvate-dehiscent a little below the middle to the apex only and not throughout. The range is given as from Canada and Florida to Kansas, while the plant is rather common in Colorado, at least at the base of the mountains on their eastern side at the junction with the Plains. Mr. Greene gives the chief characters as "leaves round-ovate, three-lobed, doubly crenate-serrate, carpels three, four, or five, connate below, one-third inch long, much inflated, usually two-seeded; seeds broadly obovoid."

In my specimens from South Boulder, Colo., collected August 15, 1878, at an elevation of 6000 feet above the sea, and distributed as No. 914, I have one branch with the following leaves on it, one leaf orbicular, not lobed, doubly crenate-serrate; two leaves rhomboidal, lobeless, and doubly serrate as above, base truncate; two leaves rhomboid-ovate, with a very broadly cuneate base, barely three to five-lobed; all the above leaves are rounded and very obtuse at apex: several leaves broadly ovate and barely acute and distinctly lobed above and in other cases below the middle; several others are ovate-lanceolate and very acute and lobed as above. The leaves are from one-half to two and one-half inches long. The pedicels are about an inch long, densely stellate pubescent, the stalk of the stellate hair

very short and the branches very long; calyx densely short-woolly within and without, lobes triangular-ovate and obtuse, a line long, equaling the tube; carpels two or rarely three, flattened, not greatly inflated, very acute, one-third inch long, tips widely divergent, dehiscent a little below the middle, appearing to be glutinous hairy but under the lens vitreous shining and very sparsely hairy with long hairs that are more or less stellate; seeds usually one in each carpel, from ovate to oblong-lanceolate, scarcely a line long and with or without a sharp inner edge, nearly acute, smooth, shining and yellow. Other specimens from the same locality have various intermediate leaves as to serration, lobation, and shape, all showing how futile is the attempt to make a character on the leaves. The venation of all the Neilliæ is really racemose in threes, and not digitate except by accident. On examining a large number of leaves we find that usually the three primary veins come out at the base of the leaf within one-quarter to two lines of each other racemosely, and only rarely exactly opposite, except in *N. monogyna* where it is more common, but this remark as to the racemoseness applies with equal force when there are five apparently digitate veins from the base; in this case the two lateral main veins are branched at base or within a line or two of it. Above the base of the leaf, about four lines, the central vein sends off a pair of secondary veins that are about one-fourth a line to a line apart, and so on. The two lateral main veins branch on the lower side into one or usually two secondary ones, the first near the base, and after that they branch like the main central vein above. The large lateral veinlet is often so near the base of the leaf as to be as near it as the point of separation of the main ones and then is called the fifth vein, but though this can be found in single or a few leaves of a plant it is always less common than the regular form. I have found it on every recognized species of Neillia.

In my specimens from Bear Creek Cañon, near Colorado Springs, the leaves are from rhomboid-ovate to lanceolate, but usually broadly ovate, one inch to three inches long and one-half to two and one-half inches wide; calyx always short-woolly on both sides, cleft two-thirds the way to the base, two and one-half lines long; pedicels glabrous or stellate-woolly;

carpels three to five, barely surpassing the calyx or even five lines long, much inflated and almost cartilaginous when short, shining and very sparsely hairy, or in the larger ones membranous, flattened, inflated much or little, abruptly acute, not greatly divergent, seeds one or more, broadly obovate, one-half a line long, ovary always densely white-hairy. From the above it will appear that the leaf character, length of carpels and shape of seeds are very variable in the oldest species.

Neillia opulifolia (L.) Brewer & Watson, var. *mollis*, Brewer & Watson; *N. capitata* (Pursh), Greene, Pittonia ii, 29.

My material comes from Oakland and from Duncan's Mills, Cal., and was collected by myself. So far as my specimens go the following is true: Leaves broader than in the type, two to two and one-half inches long, and fully as wide or wider, lateral lobes a little larger than in the type, and very rarely is there any evidence of secondary lobes, as is almost always to be found in the other species of Neillia; leaves more pubescent, and more or less cordate at base; carpels vitreous shining, inflated, very sparsely pubescent, shortly acute; seeds lanceolate obovate, incurved or straight; branches not very long nor climbing among the bushes. The corymbs are occasionally proliferous. The only character relied on by Mr. Greene, that of the seeds, proves in my specimens to be valueless, and I cannot see any other good character on which to keep up the species. In some of my specimens at least the seeds are a little narrowed at the apex, but this doubtless is not constant.

Neillia monogyna (Torrey) Greene, Pittonia ii, 30. This is the *N. Torreyi* of Watson, etc., in part. It may be advisable for the present to keep up this species, but there is no necessity for concealing the probable fact that it is only the most reduced form of *N. opulifolia*. No character that has ever been given it holds except the less inflated pod. Mr. Greene puts this under the head of "carpels indehiscent," but they are dehiscent doubtless when fully developed as that is the case with the variety *malvacea* (*N. malvacea* Greene). The form which grows on rocks in Colorado is alone sufficiently distinct, but unfortunately the forms growing on better soil and so better nourished differ. The

starved form I have seen hanging from the cliffs, branching widely and very pretty, and generally growing on rocks and occasionally along with *Jamesia Americana*, a foot or two high. This form is best represented by my specimens from Cheyenne Cañon, near Colorado Springs. The leaves are round and deeply cordate to broadly ovate, always three-lobed above or below the middle, lobes deep in some cases and scarcely recognizable in others, occasionally five to seven-lobed but less distinctly so, three-nerved or five-nerved on the same plant as it happens, digitately (as described in the beginning of this article), half an inch or less long, rather thin and almost glabrous; corymbs in my specimens never proliferous, glabrous or stellate-pubescent, ten to twenty flowered, petals one and one-half lines long and scarcely exceeding the sepals or lobes of calyx, flowers small. Another specimen from the same locality has leaves twice as large as well as flowers, and corymbs compound at base. This differs from *N. opulifolia* only in the monogynous ovary and slightly inflated pod, more incised and less pubescent leaves, and smaller size. Other specimens from the foothills are more robust and the most vigorous leaves are often quite acute and long-ovate. Utah forms seem to be rare. I have never found it in Utah, though I collected a peculiar form in the Schell Creek Mountains, Nevada near the western edge of Utah. This is a low, densely branched shrub with leaves one-fourth to one-half an inch long nearly round and usually cordate at base, always very obtuse, seldom more than three-lobed, but doubly crenate with the incisions very irregular, densely and often ferruginously pubescent on the nerves below and softly so all over, but upper surface less so; flowers very small, three to ten and about umbellate; petals not longer than lobes of calyx which are obscurely lacerate and hyaline on the margins, more so than in the smallest form of the type; stamens about twenty and the alternate ones one-half shorter, the larger ones with much dilated base; anthers oval and as in the type attached by the middle and apparently without a bloom while the type has a decided bloom and is oblong oval; style simply two-lobed at apex. Such marked characters would ordinarily be regarded as specific, but I prefer to call it var. *alternans*, though should

any of the characters given prove to hold, it may bear the name *Neillia alternans*. I fear however that it will prove to be only another of those multitudinous forms that are liable to fall into *N. monogyna* or *opulifolia*.

Neillia monogyna (Torrey) Greene *var. malvacea* (Greene, Pittonia, Vol. ii, p. 31). I have seen the type in the University of California, and recognized it at once as our common Utah form with leaves a little more developed on the sterile shoots, due to the more moist locality in which it was found. This is intermediate between *N. opulifolia* and *N. monogyna*, with the habit of the former as well as the leaves and the pod about intermediate. The calyx is not as large as in one form of *N. opulifolia* from Colorado, the lobes are of the general shape of *N. monogyna* and the calyx of every species and variety is campanulate, the lobes of all the genus would be connivent if the pods did not exceed the calyx, the calyxes of all the genus are tomentose within and without but less so without, the leaves are racemose-digitately (as given above) five-nerved in some of the larger leaves but less so than in the var. *alternans* and but slightly more so than in *N. opulifolia*. The name is not distinctive as the leaves are not so malvaceous as in *N. opulifolia* var. *mollis*. The leaves one-half to two inches long vary from reniform to ovate, lobeless to deeply three-lobed with several secondary lobes, main lobes above or below the middle, teeth minute and very many or large and few; pubescence various and inconstant everywhere except on the calyx; flowers quite large or rather small, with the general appearance of *N. opulifolia* as well as size; carpels generally two, seldom if ever inflated, united to the middle with erect or spreading tips, just equaling the calyx and lobes when well developed, slightly rugulose, shortly but not densely pubescent, and shining beneath the pubescence; seeds three, one generally larger than the others, obliquely obovate or narrower and usually somewhat flattened, as is the case with the genus, outline from the back often broadly lanceolate, smooth and shining, yellow, not larger than in *N. opulifolia* and usually shorter and broader than the var. *mollis*. The pod is dehiscent on one or both sides nearly to the middle at least in many cases though tardily; when not fully mature the pod is indehiscent

and as it is often the case that the full development is arrested by the dry weather, doubtless the majority of the carpels are by necessity indehiscent. The fruit is broadly ovate to rhombic and when the seeds occur above the middle of each carpel then it is oval, but never "orbicular" in any specimen from the Great Basin that I ever saw. The peduncles are always short and like the type. The plant is three to six feet high, grows among other brush, is widely branched and closely resembles *N. opulifolia* in general appearance, but is a little stiffer. It ranges from 7000 to 9000 feet altitude, and prefers the north side of steep mountain sides as there only can it get enough moisture. It is common in the mountains, and I have it from many localities in all stages of development.

Comparing my notes with those of Mr. Greene I find no character left to separate it from *N. monogyna* and only the flattened pod to separate it from *N. opulifolia*, while he gives *N. monogyna* as having a somewhat inflated pod which destroys the last valid distinction.

Watson reports the type *monogyna* as from the East Humboldt Mountains, Nevada, and from Stansbury Island, in Great Salt Lake. I have not seen his specimens, but presume they are the var. *alternans*.

Since writing the above I have found a fine fruiting specimen in my collection from Albuquerque, New Mexico, which belongs to the type of *N. monogyna*. The calyx is much inflated or little so, lobes often emarginate; carpels two or three in each calyx, tips needle-like and widely divergent, carpels separate to below the middle, fully as inflated for their size as the less inflated form of *N. opulifolia* from Colorado described above, or perfectly flat and silique-like, scarcely over half the length of the calyx or one-fourth longer, one to three-seeded, seeds very broadly obovate, scarcely yellow, and angular by being crowded in the carpel, carpels dehiscent and bivalvularly so to the middle. These variances all occur on the one specimen. The only way to uphold *N. monogyna* seems to be that adopted by Gray to keep up Aster, namely by an aggregation of characters no one of which is permanent, but some of which are always present when the others fail.

Prunus demissa Walpers. An examination of all my material shows that the leaves are never less than subcoriaceous and often coriaceous. The flowers are one and one-half to two times larger than those of *P. Virginiana*. The pedicels and peduncles are stouter, but longer. The shape of the leaves varies, but, on the whole, they are narrower, the bloom on the under side of the leaves varies from about the same as that of *P. Virginiana* to almost white in a specimen gathered at Albuquerque, New Mexico. The bark is duller, but otherwise I see little difference. The fruit of both is very astringent. *P. demissa* is a little stiffer than *P. Virginiana* in habit. I am very familiar with *P. Virginiana* as it exists in Iowa, and have abundance of material from there. I am very familiar with *P. demissa* as it exists in Utah, Nevada, Colorado, and New Mexico. All of my specimens from Colorado are *P. demissa*. I distributed them in 1878 as *P. Virginiana*, as at that time all those forms were supposed to be *P. Virginiana*. I doubt that *P. Virginiana* exists in Colorado. My studies confirm those of Mr. Greene, except in a few unimportant particulars, as given in Pittonia under the head of Cerasus.

CYMOPTERUS, SECTION COLOPTERA (C. & R.)

A recent examination of all my material makes it clear that this genus of C. & R. is not well founded. The character given by them in their Revision of the Umbelliferæ, p. 49, is substantially as follows. I omit such characters as are not supposed to be peculiar to the genus.

Coloptera. Involucre none; lateral wings of fruit corky thickened, dorsal filiform. All other characters given belong equally to Cymopterus. The whole genus is really founded on the corky-thickened lateral wings, a character that is also found in other species of Cymopterus in varying degree, but is concealed by the prolongation of the wings beyond the thickened part. This is seen in *C. montanus*, and were it not for the greatly produced edge of the wing it might be taken for a Coloptera, though there is no thin space between the base of the wing and the seed, as is the case in true Coloptera. In *Cymopterus Jonesii* the thickening of the wing is carried to the utmost limit at the base, and is also contracted a little there at the junction with the seed. In *Cymop-*

terus glomeratus the transition is complete. I have specimens collected at Colorado Springs, Colo., whose seeds if taken from the plants would be referred to *Coloptera Jonesii* by the appearance of the wings. This is No. 16 of my Colorado collection of 1878, now distributed widely. In *Coloptera Jonesii* the thickened part of the wing is rather firm ("corky") and varies greatly in thickness, and usually has a thin edge beyond the corky part. In what must pass for *Coloptera Parryi*, from fifty miles south of Lee's Ferry, Ariz., I find the wings much thinner than in *Cymopterus glomeratus*, and most of them with scarcely a trace of thickening, and in none of them would it be noticed by a casual look, but the plant is no doubt a true Coloptera otherwise, the more numerous oil tubes, the minute involucre, and the yellow flowers being the only distinguishing characters. In *Cymopterus globosus* the wings are thickened at the apex as much as in any Coloptera, but they are very spongy and soft. In *Cymopterus megacephalus* the wings at the apex closely resemble *Coloptera Parryi* in the variable thickening. The inconstant thickening of the wings is well shown in *Coloptera Jonesii*, where the dorsal ones are as thin as paper throughout, or nearly as thick as the lateral ones. At other times the dorsal wings are absent altogether, or only a filiform ridge; the shape of the seed is various; often it is very deeply concave, at other times it is scarcely concave; the lateral wings vary much; at times they are contracted around the deeply concave seed so as to form a cup like the variety *cupulatum* of *Echinospermum Redowskii;* at other times they are wide and flat.

Another character relied upon by Coulter and Rose for Coloptera is the absence of an involucre (which is also true of *Cymopterus glomeratus*). Unfortunately they overlooked this involucre in every case except *C. Parryi*, and I doubt not that it is found in that species also if plants fitting their description in every other respect are rightly referred there. In *C. Newberryi* and *C. Jonesii* I have seldom found it absent, but when it is reduced to a vestige as is often the case it would readily pass for a fold in the top of the peduncle and would lead one to think that the top of the peduncle was fleshy in the green plant, but that is never the case. Under the microscope this is at once

recognized as a hyaline border or involucre. In both of the above species this involucre is one-quarter to two lines wide and often quite evident as much so as in *Cymopterus montanus* the more reduced forms. In *Cymopterus decipiens* the involucre is much more evident as a rule, and in some cases it is as long as the pedicels, that is its lobes which are lanceolate and acuminate and green. *Cymopterus decipiens*, Jones is a true Coloptera, and I doubt not that it will fall into *Coloptera Parryi* eventually as the thickening of the wings is of so little account, while I think that *Coloptera Parryi* will be found to have an involucre as I have described above.

Since there is no character assigned to Coloptera by Coulter and Rose that holds, it must fall into Cymopterus where all its affinities are, where it belongs in habit, structure of the seeds, involucre and involucels. The roots also are those of Cymopterus being deep seated and tuberous like *C. montanus* and *C. glomeratus*. Fortunately this reference will not increase the species nor require much change in names, and in the end will I think reduce all the described species to one. I have not now enough forms to make me feel sure that *C. Newberryi* and *C. Parryi* pass into each other, as many of my apparently connecting forms are without mature fruit. However, the following disposition of the species will hold as far as it goes.

CYMOPTERUS, § COLOPTERA (C. & R). Flowers yellow, lateral wings of seeds thickened in the middle so as to form a ring, oil tubes numerous, involucre usually minute, hyaline.

Cymopterus Newberryi (Watson), *Peucedanum Newberryi* Watson, Am. Nat. vii, 301, *Ferula Newberryi* Watson, Proc. Am. Acad. ix, 145, *Coloptera Newberryi* C. & R. Rev. Umb. 49. Leaves pinnate and pinnæ toothed or lobed, lateral wings only developed. Southern and Southeastern Utah on clayey or sandy plains. Flowers in May and fruits in May and June. Oil tubes 4–8 in the intervals, 8–10 on the commissure. Plate XXV, fig. D.

Var. *alatus*. *Coloptera Jonesii* C. & R., Rev. Umb. 50. Dorsal wings also developed and thin or corky thickened. This shades into the type and is little more than a form of the species hardly deserving to rank as a variety. Frisco and Milford, Utah, in

gravel on mesas. Blooms in May and fruits in June. I alter the name because there is another *Cymopterus Jonesii*. Oil tubes similar but 8–12 on the commissure. Plate XXV, figs. B 1, B 2.

Cymopterus Parryi (C. &. R.) *Coloptera Parryi* C. & R. Rev. Umb. 50. Leaves bipinnate and divisions usually small, involucre absent (?), wings of fruit scarcely corky thickened, and dorsal ones almost equally developed, oil tubes one or two more than in *C. Newberryi*. Northwestern Wyoming, Parry. Plate XXV, figs. A 1, A 2.

To the above is doubtless to be referred *Cymopterus decipiens*, Jones, Zoe ii, 246, but this differs in having a hyaline involucre, though small, corky lateral wings, and well developed dorsal ones. Southeastern Utah, on clayey and sandy plains, growing along with *C. Newberryi*, and seeming to pass into it. It flowers in May and fruits in May and June. Though I first described this as often without an involucre, I find traces of one in every plant in my collection as given above. It would be readily overlooked by almost anyone in most cases.

Since the above was written Miss Eastwood has sent me, from Southeastern Utah, a specimen of undoubted *C. Parryi*, every peduncle of which has an involucre as described above. My surmise was therefore correct, and *C. decipiens* may be suppressed, being a synonym for *C. Parryi*.

In the plate accompanying this article the wings of *C. glomeratus* fig. C, were made too narrow at the apex. Seeds of other species figured are *C. longipes* fig. F, *C. Ibapensis* fig. E, *C. Jonesii* fig. G. The figures are taken from the seeds without soaking them up as that generally swells them out of all proportion and distorts the wings. I have made no effort to show other seed characters beside the wings.

Cymopterus glaucus, Watson. I see that Coulter and Rose in their Rev. Umbelliferæ, p. 81, say that my No. 1688 is this species, but it is not. It is probably *Cymopterus Ibapensis*, but is only in flower. *C. glaucus* is my No. 1687. My numbers never have been duplicated, so it is not necessary to give either the year or the locality of collection, the number tells it all. It is probable that some one has transposed the labels of the two

species in the collections examined. I have one specimen of *C. glaucus*, Watson with an involucre of five, purple hyaline margined, lanceolate bracts as long as those on the involucels.

ZAUSCHNERIA.

Zauschneria Californica Presl. (*Z. latifolia* Greene, Pittonia i, 26.) I am not in a position to discuss the western forms of this species or the species of Zauschneria in general if there be more than one species, but I can throw some light on the eastern forms as I know them well. The form which Mr. Greene calls *Z. latifolia* as described by him does not exist in this region so far as I have ever seen, though he gives it a wide range from California to Wyoming and south to Mexico.

The common form in this region has the characters of two or three of his species, *Z. latifolia*, *villosa*, and *tomentosa*, in varying degree. A form gathered at Bingham, Utah, July 20, 1880, and distributed somewhat, but not in my sets, has the petals a line longer than the calyx lobes; stamens exserted two lines longer than petals, and style four lines longer; calyx gradually enlarging from a point about two lines above the base; the base of the calyx is bulbose-enlarged; calyx one and one-fourth inches long; capsule tomentose, stipitate; plant two feet high, erect or bent at base; leaves sparingly villous and with the usual woolly pubescence reduced to a minimum, either of very short, flattened, and blunt hairs or only a papilla where the hair ought to be, but some of the leaves always minutely woolly. It is evident that the woolliness will vary with the climatic conditions under which the plant grows, and is of no specific value. This grows among the cliffs in rocks having a shallow soil, or in crevices.

Another form collected by me at Alta, Utah, in 1879, and distributed by me as No. 1141, grew at an elevation of 8500 feet above the sea on the south slope of the cañon on an almost bare ledge, and, often found by me since in similar situations in the same cañon, is six inches high from spreading decumbent woody stems; leaves short-tomentose and long-villous, lanceolate to ovate, pinnate veined, sparsely and shortly toothed; calyx enlarging from very near the base or from a point two lines above it in other

cases; stamens just exsert; capsule clavate, stipitate, sparsely villous and short tomentose; seeds smooth, favose, obovate-oblong.

Another form collected and distributed by me as No. 4270, collected at Bowie, Ariz., September 18, 1884, has leaves narrowly to broadly lanceolate, apparently glaucous, but really minutely tomentose, pilose on midrib and young shoots; two feet high; flowers twice as broad as usual, an inch long and enlarging at a point two lines above the base; uppermost leaves linear lanceolate, entire and very acute; lower leaves sharply and irregularly serrate; capsules glandular-pubescent, short stalked or nearly sessile; calyx lobes triangular and acute, nearly equaling the petals; stamens long or shortly exsert, unequal.

I see nothing in the venation of the leaves that is of specific value in any forms of Zauschneria that I know.

DODECATHEON.

This genus has received considerable attention from Dr. Gray, E. L. Greene, and Mrs. Brandegee. Dr. Gray thought he had found a new character by which to separate species, and E. L. Greene amplified Dr. Gray's species considerably. I am not in a position to throw much light on the Pacific Coast species, and I leave them to others, but I am very familiar with most of the forms of the Great Basin and of Colorado. Mr. Greene, in Pittonia ii, 72, says, under the head of *D. pauciflorum*, "The fruit of this common Rocky Mountain Dodecatheon was not known until I obtained it last year (1889)." This is not correct, as I collected and distributed the flowers and fruit of the Colorado forms in 1878 under my No. 131 in twenty different sets. I again sent them out in 1879 from Colorado. The Utah forms I distributed also in 1880 under my No. 2015. I now have both the flower and fruit of some of my original specimens.

So far as the plants east of the Sierras are concerned I doubt if any of them deserve varietal rank, unless it be one Utah form. Dr. Gray seems to have given the plants of Colorado no attention unless he considers them all to belong to the type of *D. Meadia* L.

Dodecatheon Meadia L. In the fruit retained by me in my No. 131 from Colorado the capsule is broadly elliptical ovate, and a

little surpassing the subulate calyx lobes, hardly acute; flowers many; bracts ovate and acuminate to linear and acute; corolla lobes five, about an inch long, purple; stamen tube a line long or none, yellow as in almost all other forms of the genus, purple ring present or absent; leaves oblanceolate six inches long, short or rather long petioled, entire; scapes twelve to eighteen inches high; whole plant glabrous and glandless, and the leaves not apiculate. Colorado Springs, May 30, 1878.

All the Colorado specimens in my herbarium have acute anthers, and all my Colorado and Utah specimens have the capsule splitting into five valves through the base of the style. There is no trace of an operculum large or minute falling off like a lid, as is the case in my California plants. Nearly all my Utah plants have obtuse anthers that are linear or larger at apex than below, while the opposite is the case with my Colorado specimens.

My other Colorado specimens were collected in Engelmann Cañon, June 14, 1879. They are like the above in the many flowers, bracts, corolla, and calyx, and glabrous throughout, but the stems are two feet high, leaves a foot long, linear oblanceolate or a little broader, almost acute, petiole very short, calyx oblong ovate, and just exceeding the calyx lobes, or on other stems from the same root the capsule is nearly cylindric, being a little broader at the base and one-half an inch long; in other plants from the same place the calyx is cylindric and narrow, one-half an inch long. I have a few specimens from the same locality that have broadly oblanceolate, short leaves with almost no petiole, and repand toothed, few flowers, otherwise as above, but fruit not seen.

My Utah plants No. 2015 have linear-oblanceolate leaves, with petiole half the length of leaves, and broadly or scarcely margined, whole leaf two to four inches long; scapes six to twelve inches long; flowers four-merous, purple or light-colored; stamen tube none; calyx lobes subulate; bracts lanceolate to linear and very acute; capsule ovate or urceolate, not quite equaling the calyx lobes, the five valves also notched. The whole plant is perfectly glabrous. Collected at Silver Lake, 9000 feet altitude, July 30, 1880, in American Fork Cañon, Utah. Another plant

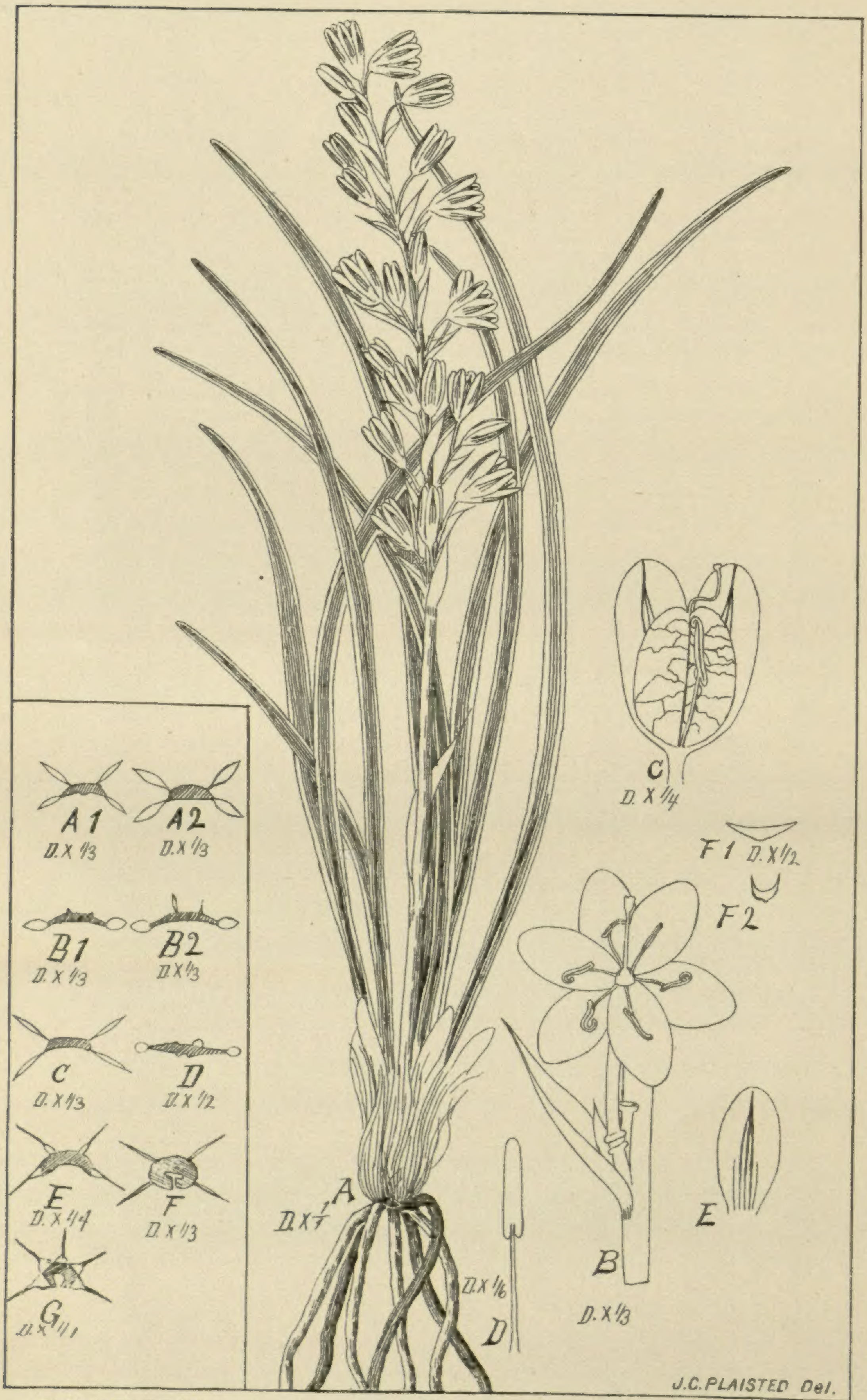
collected in City Creek Cañon, near Salt Lake City, at about 7000 feet altitude, on July 13, 1880, has broader leaves, on very long petioles, and the fruit on the same stem varies from ovate to lanceolate, equaling the calyx or surpassing it by two lines. In one pod the valves are ten and in the others five or more. This is in fruit only. In other specimens collected at Lake Shore, on the margin of Great Salt Lake, at about 4200 feet altitude, the leaves are small, two to four inches long, oblanceolate and apiculate, or rarely oval, and in that case long petioled; scapes eighteen inches long, few to several flowered; flowers five-merous, purple, small; anthers only a line to a line and a half long, and broader at the very base, tube half as long; immature fruit inclined to be cylindric.

Specimens from Sprucemont, Nevada, gathered by me on July 11, 1891, have scapes one and one-half feet high; leaves oblanceolate, barely acute, three inches long with petiole equaling blade; capsule ovate-oblong, five-valved, twice as long as the subulate-triangular calyx lobes.

Ample material from Deep Creek, Western Utah, collected June 2, 1891, has scapes one and one-half feet high, stout or slender; umbel twenty-five to fifty-flowered; pedicels one to two inches long in fruit; flowers five-merous, purple, small; stamen tube very short or as long as the anthers; anthers two lines long, with a subulate, purple beginning at base and extending above the middle, tips white as well as the margins, no purple ring; leaves four inches long or less, obovate to oblanceolate, entire, tapering into a petiole which equals the blade or is very short; capsule twice to four times as long as the subulate calyx lobes, nearly cylindric, and as in nearly all other Utah plants shortly acute, five-valved, or in many cases ten-valved.

A fruiting specimen gathered by me at Emigrant Gap, Cal., in the Sierras, July 1, 1882, has the capsule and leaves of var. *ellipticum* K. Brandegee and the anthers and stamen tube of var. *Jeffreyi* K. Brandegee. The bracts are lanceolate acuminate with filiform tips. The capsule is urceolate and a line longer than the calyx lobes.

My specimens gathered at Fall Brook, Cal., March 23, 1882, and distributed in my sets as No. 3398, have a slender scape



CYMOPTERUS.

EREMOCRINUM.

twelve to eighteen inches high; leaves one to two inches long, oblanceolate to obovate, quickly contracted into a short-margined petiole, finely and closely laciniate-dentate, thick; bracts and adjoining pedicels glandular pubescent; flowers five-merous, large or very large; anthers small one and one-half lines long and blunt, purple-margined and white in the centre; stamen tube about a line long, and deep purple; bracts hyaline, six lines long and lanceolate acuminate, or oblanceolate, petiolate, and green and leaf-like.

Another form collected by me at Soda Springs, Sierra County, Cal., July 27, 1881, answers to var. *Jeffreyi*, K. Brandegee.

If I were disposed I could certainly make at least three new species out of my material fully as good as any that Dr. Gray has described, but I cannot resist the conviction that there is but one polymorphous species whose separation even into varieties is warranted only by the desire to arrange the forms in some kind of succession.

EREMOCRINUM, nov. gen.

This genus belongs to the Liliaceæ, subtribe Anthericeae, and appears to be nearest to Anthericum, though it has some characters in common with Leucocrinum and Glyphosperma Watson. Perianth rotate, segments three-nerved, white and thin, nerves green; anthers linear, blunt, lobed at base, erect, basifixed and edge to ovary, smooth; filaments linear, broader at base, straight, smooth; slender style elongated, enlarged and capitate at apex; capsule oblong and bluntly lobed, cells apparently two-seeded; pedicels rather stout and jointed near the base; flowers racemose spicate; roots many, long and slender, fleshy, some horizontal; rootstock very short and erect.

EREMOCRINUM ALBOMARGINATUM. This is *Hesperanthes albomarginata* Jones, Zoe, ii, 251. The only change I would make is in the anthers and filaments which I find are not pubescent. I have not yet the mature fruit of this plant. From the first I felt sure that it was a new genus and I withheld it from publication for about a year hoping to be able to decide the matter, but being unable to satisfy myself I finally published it as Hesperanthes, though I knew it did not agree with that genus

nor any other that I knew. The name of Desert Lily will fit this plant perfectly, and this is the meaning of the generic name. The leaves are flat and narrow and not terete as would be inferred from my original description. The pollen grains are large, acute at each end and elliptical. The tip of the anthers just equals the style in flower. Capsule ovate to oval, scarcely crested.

EXPLANATION OF PLATE XXV.

EREMOCRINUM: "A" plant natural size, "B" flower and pedicel enlarged three diameters, "C" pod enlarged four diameters, "D" stamen enlarged six diameters, showing the auricled base of anther, "E" segment of perianth showing nerves, enlarged three diameters, "F 1" cross-section of upper part of leaf "F 2" cross-section of lower part of leaf.

CYMOPTERUS: "A 1" seed of *C. Parryi* showing wings, "A 2" same with wider wings, "B 1" seed of *C. Newberryi* var. *alatus* without wings on back, "B 2" same with wings developed one of them corky thickened, "C" *C. glomeratus* with wings thickened as much as in *C. Parryi* one form, "D" *C. Newberryi* with one rib thickened nearly as much as the lateral ones, a common occurrence; "E" *Cymopterus Ibapensis* Jones; "F" *C. longipes* with some of the wings enlarged in the middle after the fashion of the above; "G" *C. Jonesii.* The enlargement of each is shown by the fraction underneath.